Determinants of Environmental Design Achievement of Buildings (Case study administrative buildings in Lattakia)

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Abstract:
There has been a number of changes in architectural practice under the title of modern architecture, neglecting many aspects of humanity, environment and life in most architectural designs. In recent times, the architectural activity has been marked with enthusiasm and the calls and appeals of most organizations and specialized scientific research centers have tended to move towards more environmentally friendly designs. To consider how to make the buildings environmentally friendly, and this study dealt with administrative buildings as the most important component of the city's fabric and are considered buildings in charge of operation and absolute quantities of large outputs of the operation, In the city of Lattakia is environmentally deficient and far from the concepts of environmental design so it was necessary to develop a list of standards and determinants that help engineers and specialists in the design of administrative buildings that are environmentally friendly and ensure a healthy and psychological life for its users

Keywords: Environmental Design, Environmental Architecture

1- **Introduction:** The environmental architecture and environmental design are the important and complex topics that have been given great attention by specialized scientific and international research centers and have become a major part of efforts to preserve the environment. The environmental architecture was the close interaction between the citizen and the environmental factorsaround him, which achieve the citizen enough of his environmental requirements and minimum environmental pollution and the acceptable level of health conditions necessary for his livelihood, Which in turn reflects the quality and efficiency of the urban environment and the extent of belonging to that environment and taking good care of.

2- **The importance of research and its objectives**: The importance of the research is that the determination of the foundations and standards that aim achieving the environmental design of the buildings, especially in the local architecture has great repercussions on the economic, social, aesthetic, health, psychological and other aspects. Therefore, the research aims mainly to reach the foundations and applied criteria for architectural designs for administrative buildings, Lattakia City in particular, and constitutes a base for the preparation of future administrative designs based on the concept of environmental architecture as the basis for the development of architectural design.

3- **Research Methods**: This research deals with the concept of environmental engineering and environmental design and the identification of the most important international standards for architectural design and its application to models of modern administrative buildings in the city of Latakia to determine the extent to which they achieve environmental design standards.

3-1- Environmental architecture Definition: It is an architecture existas a result of its environment and with responsibility towards it, an architecture that respects the earth's resources and natural beauty. It is an architecture that provides the needs of its users, it helps to maintain their health, their satisfaction, increase their production and satisfy their spiritual needs by taking care of the implementation of proven strategies for environmental sustainability.[1]

3-2- The concept of environmental design: It is the specialization related of solving the problems of the environment and preserving it and toservice the humankind. It is the science that resulted from the integration of architecture as an art and engineering with theenvironment.
This specialization has emerged since the early 1950s as a natural reaction to environmental problems that have become very complex in order to formulate comprehensive and radical policies and programs that contribute to the preservation and improvement of the environment in both existing cities and which will be built in the future,Thus contributing the urban citizento belong to his environment, This means finding healthy and safety buildings that do not affect or change much in the surrounding environment.[1]

3-3-Global standards for environmental design: There are ten basic global standards approved in the process of environmental design of buildings and we will discuss each briefly:

1. **Use of natural energies:** Use energy for cooling or heating to provide comfortable thermal inside the building, comfortable Thermalis givinga completely physical and mental sensation of comfort, Global buildings rely on the use of natural energies. Figure 1, the most important sources of natural energy: solar energy - hydropower - aerobic energy - geothermal energy - organic energy - nuclear energy**.**[2]

Figure 1: Models for use Wind energy and solar energy
Source: Website: http://www.google.com.eg/search?biw=1517&bih=741&tbm=isch&oq

2. **Environmentally building materials:** Conditions and requirements for materials tobe an environmentally:
   • Do not be high-energy for manufacturing, installation or maintenance.
   • Do not contribute to increase the internal pollution of the building.
   The materials and finishes which have a detrimental effect on health should be excluded, Industrialmaterials should not be used inside the homesand mustreplace with natural materials, such as clay and paints that depend on natural oils.[2]

3. **Methods of water conservation within buildings:** In addition to the well-known water uses, it has aesthetic and environmental uses, which helps to control moisture and leads to air purification and cooling. An appropriate method for conserving indoor water is to rationalize indoor water consumption and reuse of treated wastewater after treatment, rain collection and reuse.[2]

4. **Indoor air quality:** The danger of air pollution inside the building is that the percentage of this pollution exceeds dozens of times air pollution abroad and the causes of indoor air pollution:

   • Increased use of building materials and various finishes.
   • Poor ventilation because modern buildings are closed to increase efficiency of cooling and heating processes**.**[2]

5. **Lighting and building:**
   • **Natural lighting:** Natural lighting comes in second place, Good design should include a good distribution of openings to obtain the maximum natural light, allowing the person to obtain UV rays through open spaces, and taking into account the height of the buildings and the distances between them for not blocking the natural light.

   •**Industrial lighting:** Used in two cases: the first when the natural lighting is inadequate,the second in the dark**.**[2]

6. **The philosophy of using colors:**Color has an aesthetic, psychological and physiological effect on the human body, and it affects the absorption of walls and roofs of solar radiation.[2]

7. **Sound design and noise avoidance**: Noise has a detrimental effect on human health and causes 70% of neurological diseases. Noise sources are multiple from outside the building and from inside. Therefore,the use of high-efficiency walls and floors can address and reduce noise, and the cultivation of green belts and trees will reduce their severity.[2]

8. **Security design of the building:**In order for the building to be environmentally, it must be safety, for example:
   • Study each area or site to avoid natural hazards such as floods and earthquakes.
   • Avoid hazards that could threaten the safety or occupants of the building which are caused by human negligence or mismanagement
   • Use of alternative materials for flammable one**.**[2]

9. **Environmentallyarchitectural character**: The most important characteristics of an environmentally building is the compatibility of the architectural character of the building with the surrounding environment historically and socially. The factors affecting the architectural character are:

1. Natural factors: climate, geography, local building materials.

2 - Civilizational factors: religious, social, political, economic, with philosophy, science and art.[2]

10. **Garden and building**:One of the most important advantages of green areas is the purification of air from dust and suspended residues, as well as psychological impact**.**[2]

3-4- Analytical study of the environmental design fortwo models of administrative buildings in Lattakia:

The administrative and government buildings are the basic components of urban fabric in the city, as they are an attractive element of the population because of the services which they provide. It is a visual element through the distinctive architectural character of these buildings and the space that it occupies[3].

These buildings and their sites are supposed to achieve a set of conditions, such as: sufficient space to secure the necessary parking, the suitablespaces for the movement of building users, the good road connections forbuilding users to enable them to reach in an easy and safe way, and theHarmony with neighboring buildings as much as possible .... etc, in addition to the environmental standards that must be available in buildings in order to reduce energy consumption from non-renewable resources and resort to renewable sources of energyto prevent the depletion of environmental resources and to live in a safe and healthy city.The choice of administrative building sites shouldachieve to environmental, engineering, social and economic compatibility.

However, these conditions are not always taken into account, such as selection the sites of some administrative buildings in Lattakia city because the current organizational chart did not notice enough sites for such buildings which are commensurate with the expansion of the geographical area of the city, the increase in its population and the economic and social development of the country.Therefore, the urgent need to change the organizational characteristics of some sites to secure the required buildings without focusing on the conditions that should be provided in those sites.

The environmental analysis study was conducted on two models of administrative buildings in Lattakia city to extent howthe studied model of global environmental conditions and standards have been achieved. The two models studied are:

• New Governorate Palace - Sheikh Dahir Square.

• Tobacco Management Building - Agriculture Roundabout.

3-4-1-The first model: the building of the new Governorate Palace:

Project Name: New Governorate Palace Building.

Location: Lattakia - Sheikh Dahir Square.

Description: it is a government administrative building located in Sheikh Dahir Square in Lattakia, it is a busy and crowded area, the buildingConsists of nine floors in addition to the ground floor and a basement with a garage, warehouse, heating and maintenance rooms and an external garage for 25 cars, the building was raised on columns, Gothic arches were also used in the elevations of building.

Figure 2: The building and location of the new Governorate Palace building
Source: The lens of the researcher+ google earth.

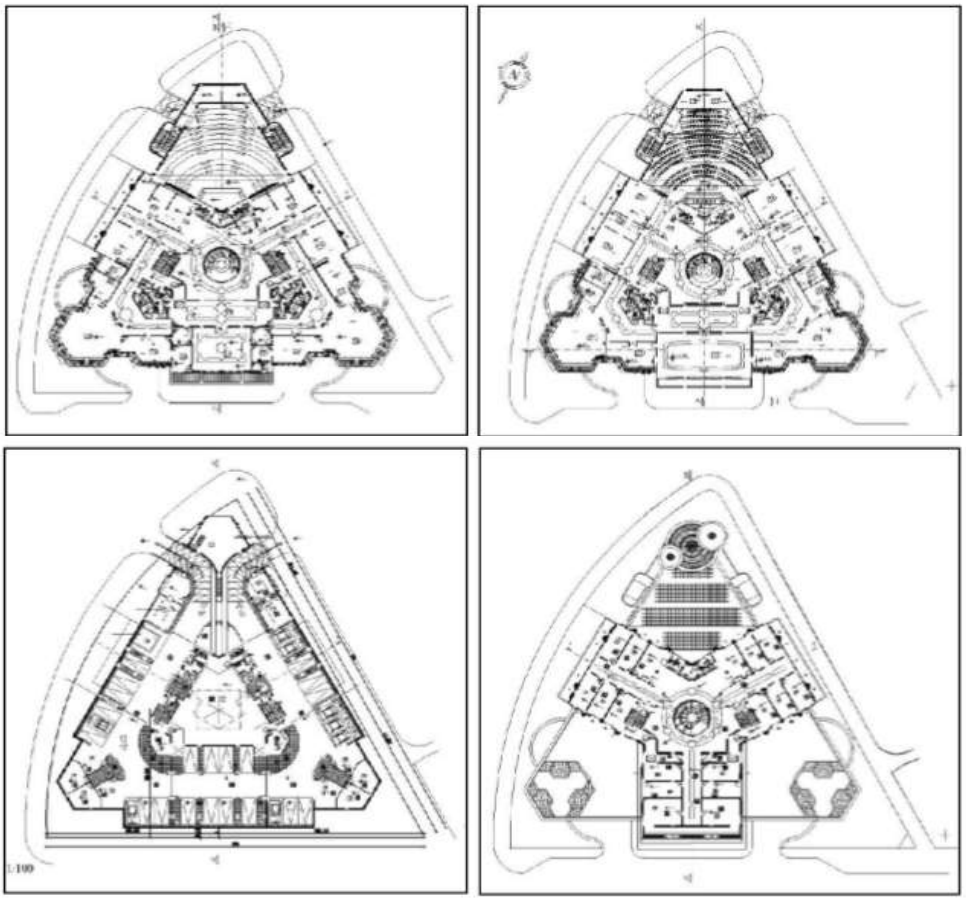


Figure 3: Some horizontal projections of the new Governorate Palace building with perspective.
Source: Dr. Eng. Nidal Mohammed Office[4]

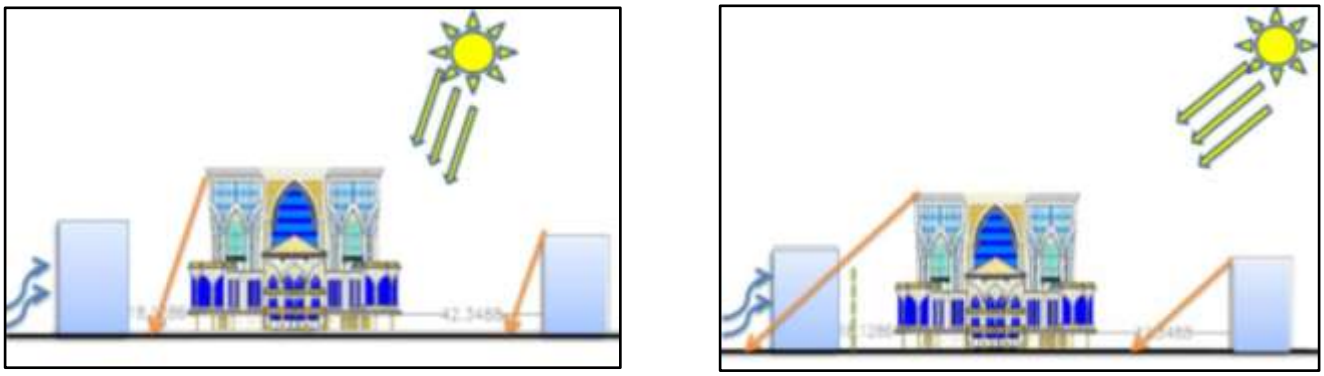


Figure 4: The effect of solar radiation and the shadows of neighboring buildings on the building in the morning hours: The south-eastern elevation (Prepared by the researcher)

Building height	41.15 m
The distance from the neighborhood	42.3 m east, 18.1 west
Theheight of the building next door	25 m east, 28 m west

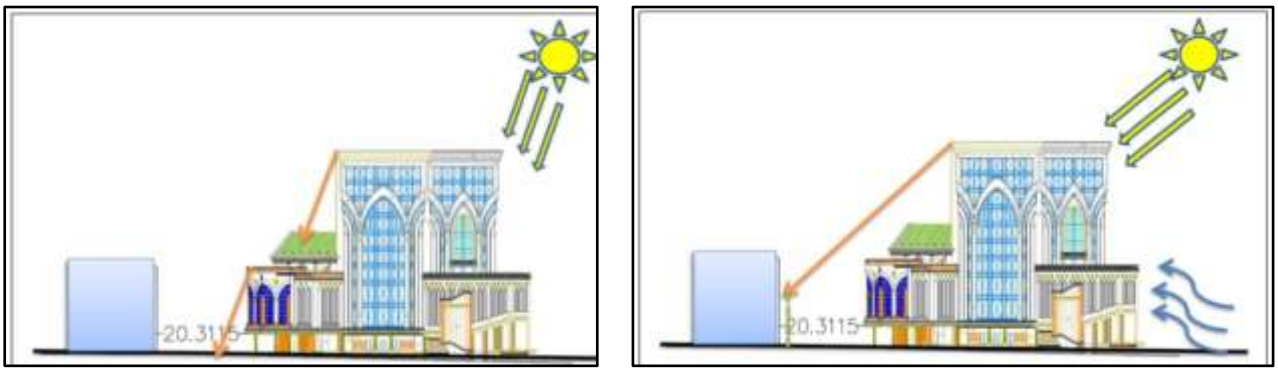


Figure 5: The effect of solar radiation and the shadows of neighboring buildings on the building in the afternoon hours: The south elevation (Prepared by the researcher)

Building height	41.15 m
The distance from the neighborhood	20.3 m
Theheight of the building next door	16 m

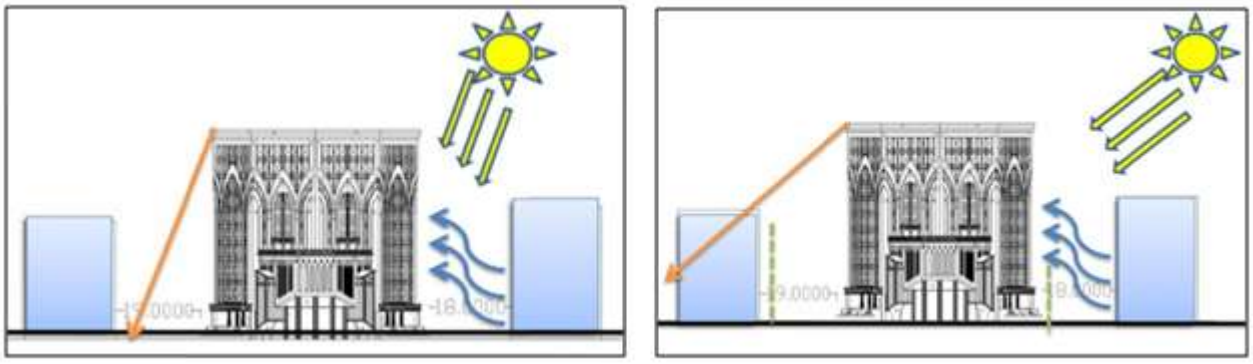
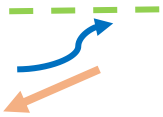


Figure 6: The effect of solar radiation and the shadows of neighboring buildings on the building: The North West elevation (Prepared by the researcher)

Building height	41.15 m
The distance from the neighborhood	19 m east,18 west
Theheight of the building next door	25 m east, 28 m west

- Non-exposed parts of the sun
- Wind direction
- Solar radiation



-Calculate the percentage of openings in the facades: In warm, humid environments, porosity should be between 30-35%.

Interface	**Interface space**	**Area of openings**	**porosity**
South east elevation	2347 m^2	960 m^2	41%
South west elevation	2699 m^2	816 m^2	30.2%
North east elevation	2699 m^2	820 m^2	30.3%
North west elevation	2024 m^2	518 m^2	25.6%

Total height of the building	41.15 m
Elevations areas	9769 m^2
Totalarea slots	3114 m^2
Porosity	32%

Measuring how much the project achievethe global environmental standards:

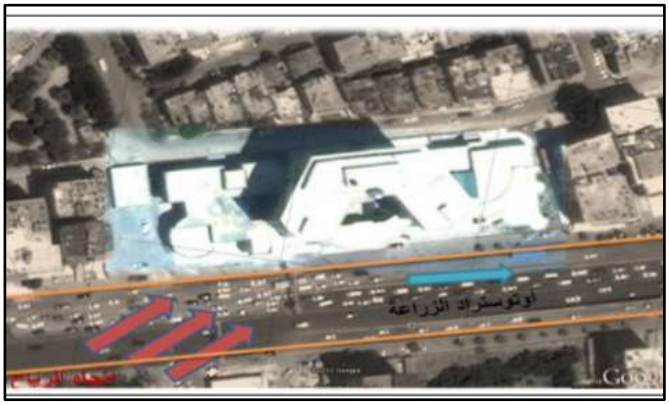
Project Name: The new Governorate Palace building in Lattakia.	
Use of natural energy	The southern elevation was used to provide natural heating in winter, and the large slots allow access to solar radiation
Environmentally building materials	Use large areas of glass Scattered the solar radiation which necessary for heating Where the glass is installed directly on the concrete without the appropriate insulation, which increases the transfer of convection inside the building and therefore the energyconsumption in the summer is greater, but the stone which used to finish some part of elevationsconsidered a good heat insulation.
Preserving the water inside the building	The presence of a water fountain inside the lobby of the building leads to increased humidity which we do not need in the coastal environment but helps to cool the air.
Air quality inside the building	The presence of a patio inside the building acts as a thermal reservoir and provides proper shading and good ventilation inside the building, and rising the building on columns provides air-conditioning passages soothing the internal environmental.
Lighting and Building	Large slots provide natural lighting of the building, especially directing most of the offices on the south elevation, and neighboring buildings do not shade the building.
The philosophy of using colors	The use of blue color for windows suits the sea color and the coastal environment and gives comfortable sensation, and the color of white stone reduces the amount of solar radiation in summer.
Sound design and noise avoidance	No soundproofing was used except for the concert hall and the conferences on the first floor.
Security design of the building	The building was provided with survivalstairs on both sides of the back but not accessible to all users of the building. The building was not studied against earthquakes or provided with any fire alarms.
Environmentally architectural character	The designer's use the Gothic arches thatnot suitable for the natural location and heritage of the region. On the social side, the closed projection system has been used and is likely to be used because of the privacy of the occupants of the building and for political and security reasons.
The garden and the building	We do not notice any green spaces or areas that soften the atmosphereand cause thecomfortable sensation of the occupants of the building because of the limited space surrounding the building except for some green surfaces, which the designer used as a solution to revive the building environmentally.

The result:

- The building achieved a good porosity ratio suitable for natural ventilation and apnea.
- In the study of the effect of solar radiation on the building row, we find the effect of the building on the neighborhood and the influence of the neighborhood, but in the winter and in the morning and afternoon, the effect of the shadows clearly on the building adjacent to the building from the south and west of the Western North.

3-4-2-Second Model: Tobacco Directorate Building:

Project Name: Tobacco Directorate



Building

Location: Lattakia - Agriculture Roundabout.

Description: The building consists of nine floors and two floors to the basement. The difficulty of the building design is in the shape and size of the land, the big difference between the length of the two ribs, and the narrow area of the land prevented the investment of gardens around the building.

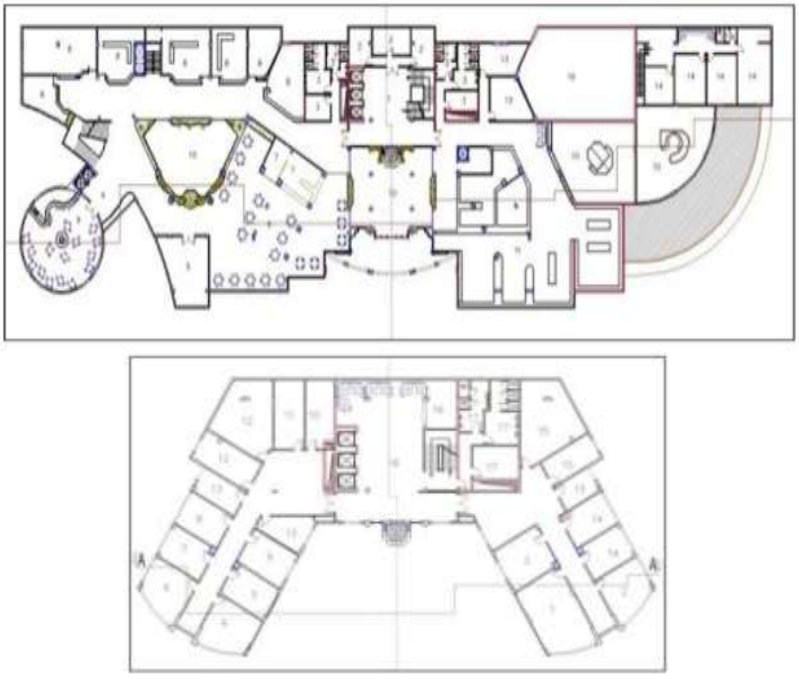


Figure 7: The building and location of the Tobacco Directorate Building

Source: The lens of the researcher+ google earth.

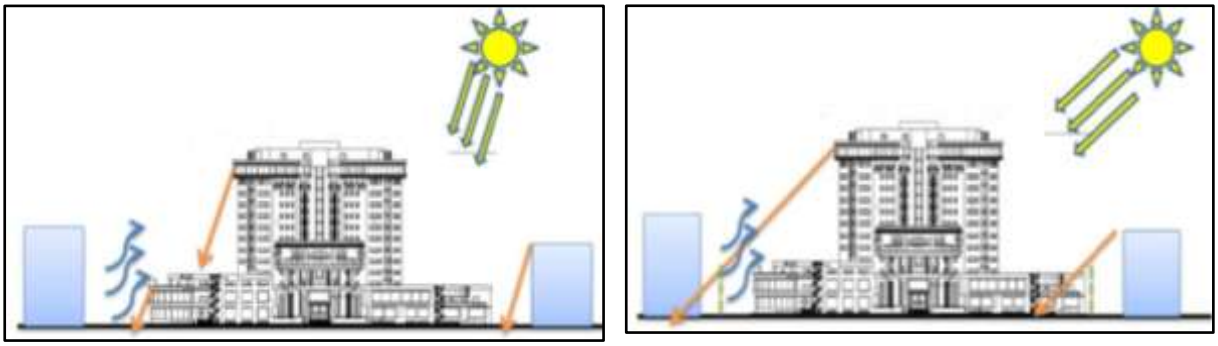


Figure 8: The effect of solar radiation and the shadows of neighboring buildings on the building in the morning hours: The south elevation (Prepared by the researcher)

Building height	48 m
The distance from the neighborhood	16 m east,10west
The height of the building next door	20 m east, 23 m west

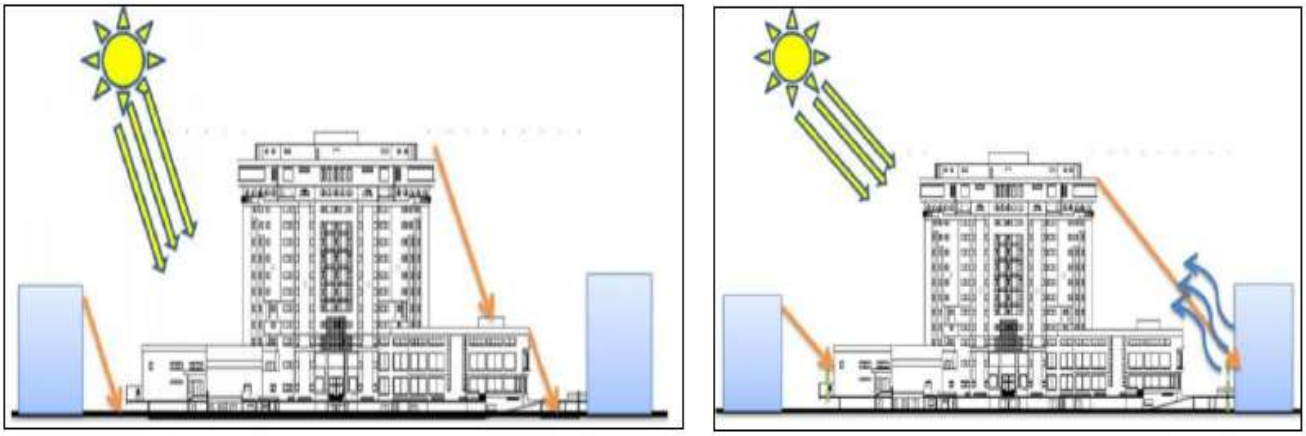


Figure 9: The effect of solar radiation and the shadows of neighboring buildings on the building: The north elevation (Prepared by the researcher)

Building height	48 m
The distance from the neighborhood	16 m east, 10 west
The height of the building next door	20 m east, 23 m west

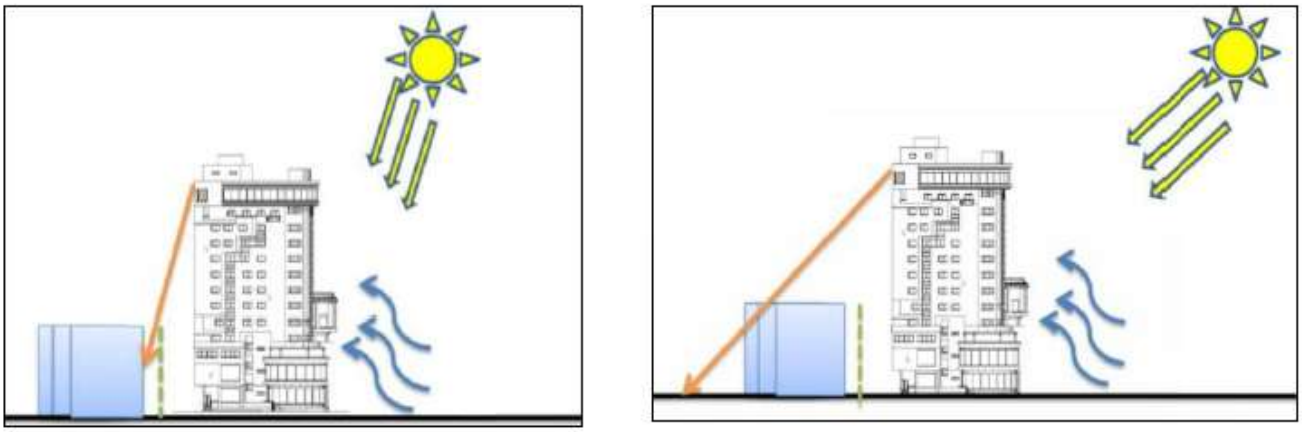


Figure 10: The effect of solar radiation and the shadows of neighboring buildings on the building: The west elevation (Prepared by the researcher)

Building height	48 m
The distance from the neighborhood	10 m north
The height of the building next door	16 m north

Interface	**Interface space**	**Area of openings**	**porosity**
South east elevation	2682 m^2	937 m^2	35%
South west elevation	2701 m^2	460 m^2	17%
North east elevation	1161 m^2	235 m^2	20%
North west elevation	1130 m^2	271 m^2	23%

Total height of the building	43 m
Elevations area	7674 m^2
Totalarea slots	1703 m^2
Porosity	22%

Measuring how much the project achievethe global environmental standards:

Project Name: The new Governorate Palace building in Lattakia.	
Use of natural energy	The south elevation for natural heating in winter has been utilized by adopting the V shape of the tower, which includes the administrative offices of the directorates in the building
Environmentally building materials	Ceramic and marble materials are not considered to be a good heating insulation, especially in high-humidity coastal areas, which leads to increased humidity within the building in winter and which increase the necessary heating costs.
Preserving the water inside the building	Water has not been reused as an environmental manner.
Air quality inside the building	There are glass openings on sufficient spaces and the direction of the building's large rib towards the southwest wind provides natural and good ventilation for the administrative offices inside the building.
Lighting and Building	The glass slots provide natural lighting of the building, especially the directionof the most offices towards the south, but the neighboring buildings partially shade the building in summer but does not affect the offices in it.
The philosophy of using colors	The use of blue color for windows suits the sea color and the coastal environment and gives comfortable sensation.
Sound design and noise avoidance	No soundproofing has been used in the building, the distance from the motorway is very close, and there are no surrounding trees to relieve congestion of the cars in this area.
Security design of the building	The building was provided with survival stairs on both sides of the back but not accessible to all users of the building. The building was not studied against earthquakes or provided with any fire alarms.
Environmentally architectural character	Historically, the building is considered as a modern style building, socially the use of the Vshaped of the towergives the users of the building feeling of communication with the outside.
The garden and the building	We do not notice any green spaces or areas that soften the atmosphereand cause thecomfortable sensation of the occupants of the building because of the limited space surrounding the building.

The result:

- The building did not achieve the desired porosityand appropriate in the humid warm environment.
- By studying the effect of solar radiation on the building in summer and winter, we find thenegative effect of the shades of the building on the neighborhood from the north and significantly, but in the summer at the morning and the afternoon, the partly effect of the building shadows on the neighboring buildings from the eastern and western sides.

Conclusions:

1. The study pointed out that the concept of the environment does not only require the climatic meaning but also the social, economic, cultural and various aspects of life of the region in which a society lives
2. Research has shown that the building of administrative buildings in the city of Latakia lacks environmental studies and is almost non-existent, and if there are some environmental cases, it is very simple, depends on guidance and take advantage of local climate no morethan that.
3. The research concluded that one of the most important reasons for the weak design of the administrative buildings particularly in Lattakia is lack of public awareness of the environmental concepts of the designers and the lack of practical experience.
4. Building designers focus on form and function without considering the economic aspect that can be achieved by applying the environmental design standards that are based on the concepts of environmental architecture.

Recommendations:

1. When designing any administrative buildingshould be placed on studying of the architectural composition and link itwith the environmental aspect in terms of functional distribution, structural systems, implementation methods and building materials.
2. When starting the process of designing the building on paper it is necessary to rely on the codes and local environmental regulations and according to the nature of each area
3. The need for a list of environmental standards for the local area according to the climatic conditions should be adapted by the institutions, consulting offices, engineering bodies concerned.
4. Encouraging projects under the title of environmentally friendly buildings and highlighting the importance of these projects in reducing environmental pollution and using them for natural energies such as solar and wind energy.
5. Emphasize the importance of the role of government agencies in the public and private sectors in adopting development projects that use environmental technologies to be vital models to inform the public sector of the benefits of these trends and their potential and give the concept of Environmental architecture within national strategies and plans.

Reference:

[1] Elswat, A. J. (2007),"Sustainable planning and environmental architecture,“Aldammam.

[2] Wazery, y. J. (2005), "Environmentally friendly architectural design forward green architecture ” ,General Authority for Educational Buildings, Egypt.

[3] Alasaad, A. (2007) ,” The mass formations of administrative buildings, their reality and their foundations in Syria,“ Faculty of Architecture, Damascuse University.

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